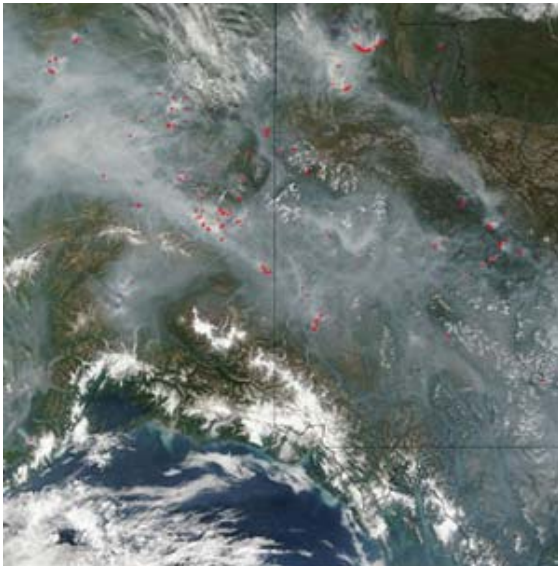


# Revising the Air Quality Index and Setting a Significant Harm Level for PM<sub>2.5</sub>



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# Overview

- What we'll cover:
  - Possible revisions to AQI sub-index for  $\text{PM}_{2.5}$  – lower end of the range
  - Possible Significant Harm Level (SHL) for  $\text{PM}_{2.5}$  – upper end of the range
- Key questions
- Next steps



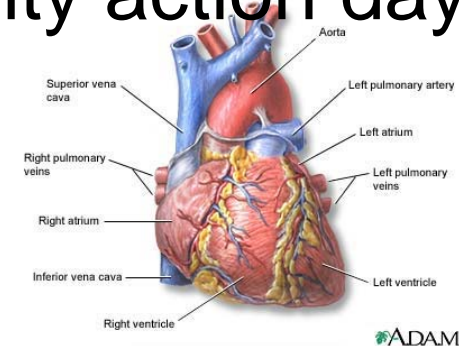
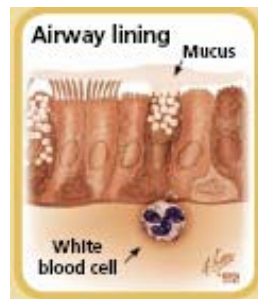
# EPA's PM Standards: Old and New

	1997 Standards		2006 Standards	
	Annual	24-hour	Annual	24-hour
<b>PM<sub>2.5</sub></b> <b>(Fine Particles)</b>	<b>15 µg/m<sup>3</sup></b> Annual arithmetic mean, averaged over 3 years	<b>65 µg/m<sup>3</sup></b> 24- hour average, 98 <sup>th</sup> percentile, averaged over 3 years	<b>15 µg/m<sup>3</sup></b> Annual arithmetic mean, averaged over 3 years	<b>35 µg/m<sup>3</sup></b> 24- hour average, 98 <sup>th</sup> percentile, averaged over 3 years
<b>PM<sub>10</sub></b> <b>(Coarse Particles)</b>	<b>50 µg/m<sup>3</sup></b> Annual average	<b>150 µg/m<sup>3</sup></b> 24-hr average, not to be exceeded more than once per year on average over a three year period	<b>Revoked</b>	<b>150 µg/m<sup>3</sup></b> 24-hr average, not to be exceeded more than once per year on average over a three year period



# Why Are We Doing This?

- To reflect change to PM<sub>2.5</sub> daily standard
  - 24-hr PM<sub>2.5</sub> NAAQS was set in 1997 to provide protection against “hotspots” or risks from seasonal emissions
  - 24-hr PM<sub>2.5</sub> NAAQS (35 µg/m<sup>3</sup>) set in October 2006 to protect against health effects of short-term exposures
- States are asking for AQI to be updated
- Many agencies have already changed the level at which they call air quality action days





# Typical Lower End of the AQI Range

Air Quality Index	
Categories	Index Values
Good	0 – 50
Moderate	51 – 100
Unhealthy for Sensitive Groups	101 – 150
Unhealthy	151 – 200
Very Unhealthy	201 – 300
Hazardous	301 – 500

- ← Annual Standard
- ← Short-term Standard
- ← General Population Benchmark

# Current AQI Sub-Index for PM<sub>2.5</sub> Is Different

- Daily standard provided protection against risks from “hot spots” or seasonal emissions of PM<sub>2.5</sub>
- Annual standard provided bulk health protection against effects of short-term exposures

Air Quality Index	
Categories	Index Values
Good	0 – 50
Moderate	51 – 100
Unhealthy for Sensitive Groups	101 – 150
Unhealthy	151 – 200

← Annual Standard (15 µg/m<sup>3</sup>)

← Midpoint Range (40 µg/m<sup>3</sup>)

← Daily Standard (65 µg/m<sup>3</sup>)

# Possible Revisions to Lower End of Range

- Set an AQI value of 100 equal to the level of the 24-hr  $\text{PM}_{2.5}$  NAAQS ( $35 \mu\text{g}/\text{m}^3$ ) – appropriate benchmark
- Reduce an AQI value of 150 (now  $65 \mu\text{g}/\text{m}^3$ ) to 55  $\mu\text{g}/\text{m}^3$ , which is in proportion to reduction in AQI value of 100 (from 40 to  $35 \mu\text{g}/\text{m}^3$ )
- Based on the more extensive and stronger body of evidence linking 24-hr  $\text{PM}_{2.5}$  levels to serious morbidity and mortality effects
- Leave AQI value of 50 at level of annual NAAQS ( $15 \mu\text{g}/\text{m}^3$ )



# Upper End of AQI Range

Air Quality Index	
Categories	Index Values
Good	0 – 50
Moderate	51 – 100
Unhealthy for Sensitive Groups	101 – 150
Unhealthy	151 – 200
Very Unhealthy	201 – 300
Hazardous	301 – 400
	401 – 500



## Emergency Episode Plans

- ← Alert Level
- ← Warning Level
- ← Emergency Level
- ← Significant Harm Level (SHL)



# SHL and Emergency Episode Plans

## Subpart H - Prevention of Air Pollution Emergency Episodes

- SHL is a level that represents imminent and substantial endangerment (§51.151 CFR)
- Currently there are SHLs for CO, NO<sub>2</sub>, O<sub>3</sub>, PM<sub>10</sub> and SO<sub>2</sub>
- States must have contingency plans in place to avoid ever reaching the SHL
  - Need for plan is based on past air quality levels and priority level definitions (§51.150 CFR)
  - States should periodically reevaluate priority classification of all regions or portions of regions within their borders (§51.153 CFR)
- Plans must include actions at levels below the SHL (§51.152 CFR)
- These plans often include 3 levels, the Alert, Warning and Emergency levels



# Current Index Value of 500 for PM<sub>2.5</sub>

- The 500 level of the AQI for PM<sub>2.5</sub> was set at 500  $\mu\text{g}/\text{m}^3$  about the same level as British Smoke (which has a cut-point of approximately 4.5 microns) from 1950's air pollution episodes
  - We indicated that if an SHL for PM<sub>2.5</sub> is set at a different level we would adjust AQI accordingly
- The SHL for PM<sub>10</sub> is 600  $\mu\text{g}/\text{m}^3$ , also based on British Smoke levels
- We did not have enough PM<sub>2.5</sub> monitoring data to scale an index value of 500 to the PM<sub>10</sub> SHL



Donora, PA at noon on  
Oct. 29, 1948



London buses are escorted by lantern  
at 10:30 in the morning.

# Possible Revisions to Upper End of Range

- Set the  $\text{PM}_{2.5}$  SHL at  $350 \mu\text{g}/\text{m}^3$ , 24-hr average
  - Scaling SHL to  $\text{PM}_{10}$ , since on average about 60% of  $\text{PM}_{10}$  consists of  $\text{PM}_{2.5}$
- For intermediate breakpoints between an AQI value of 100 and SHL, set to reflect a generally linear relationship between increasing index values and increasing  $\text{PM}_{2.5}$  concentrations
  - Consistent with health evidence
  - Consistent with practice of setting breakpoints in symmetrical fashion where health information does not suggest particular levels
  - Easier for agencies to implement
- Problem [good thing] is that this is based on episodes that happened a long time ago. It would be useful to have information about more recent episodes.

# Current and Possible PM<sub>2.5</sub> Sub-Index

Air Quality Index (AQI)			
Category	Index Values	Current PM2.5 Levels (ug/m3, 24-hr average)	PM2.5 Levels Under Consideration (ug/m3, 24-hr average)
Good	0 - 50	0.0 - 15.4	0.0 - 15.4
Moderate	51 - 100	15.5 - 40.4	15.5 - 35.4
Unhealthy for Sensitive Groups	101 - 150	40.5 - 65.4	35.5 - 55.4
Unhealthy	150 - 200	65.5 - 150.4	55.5 - 140.4
Very Unhealthy	201 - 300	150.5 - 250.4	140.5 - 210.4
Hazardous	301 - 400	250.5 - 350.4	210.5 - 280.4
	401 - 500	350.5 - 500.4	280.5 - 350

# Possible Revisions to the AQI for PM<sub>2.5</sub>

## What the Monitoring Data Show



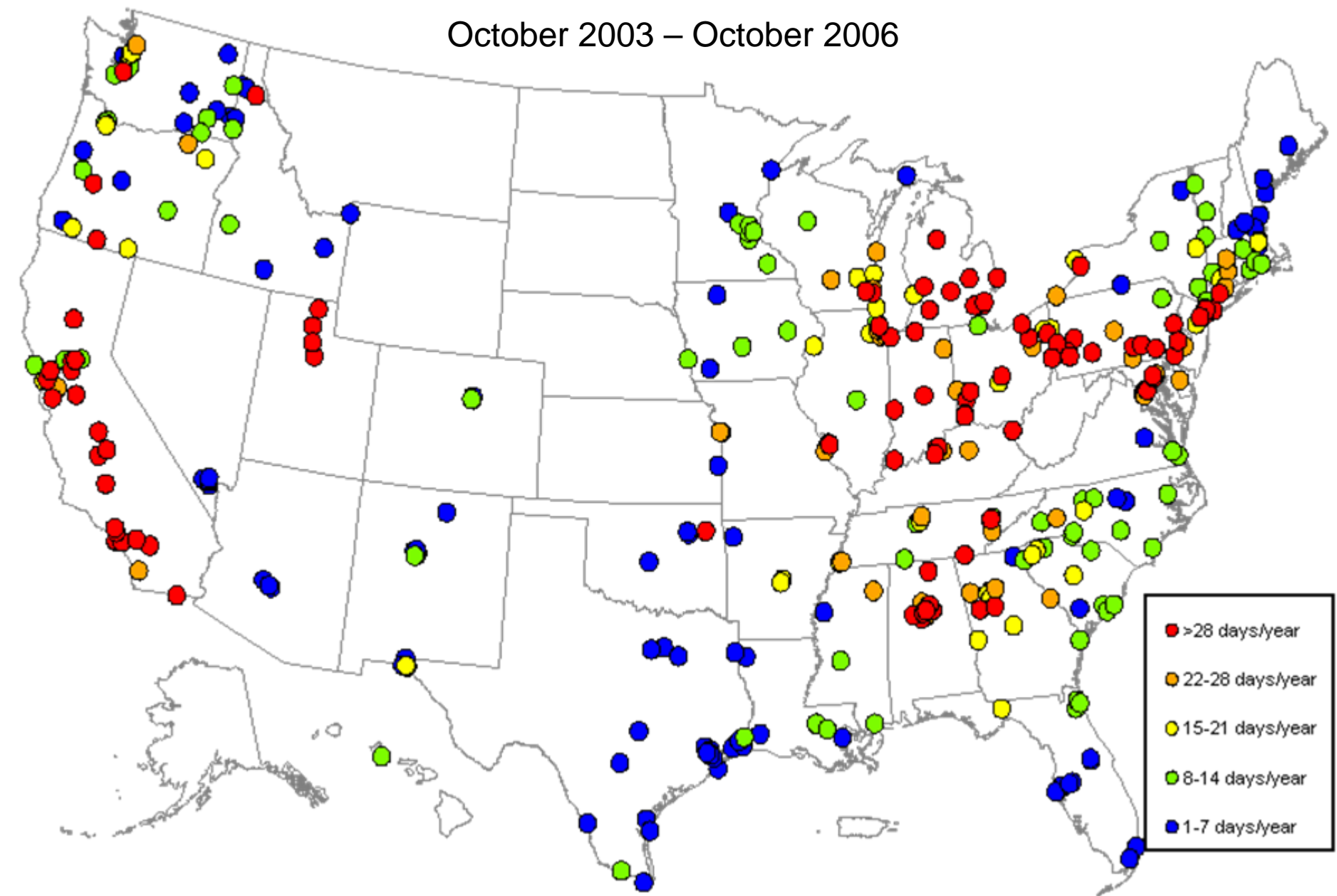
# Air Quality Analyses

- Site analysis showing increase in days per year if 100 level is dropped to 35 ug/m<sup>3</sup> with additional map showing new sites affected
- USA Today Cities
  - Comparison between current AQI and possible AQI
    - 35 ug/m<sup>3</sup> vs. 40 ug/m<sup>3</sup>
    - Differences in number of days per category
    - Comparison of categorical AQI distributions for each scenario
- A count of the site days in the “Very Unhealthy” and “Hazardous” categories to determine any increases
- Sites with concentrations > SHL compared to the current SHL and possible SHL



# Average Number of Days per Year $\geq 35.5 \text{ ug/m}^3$

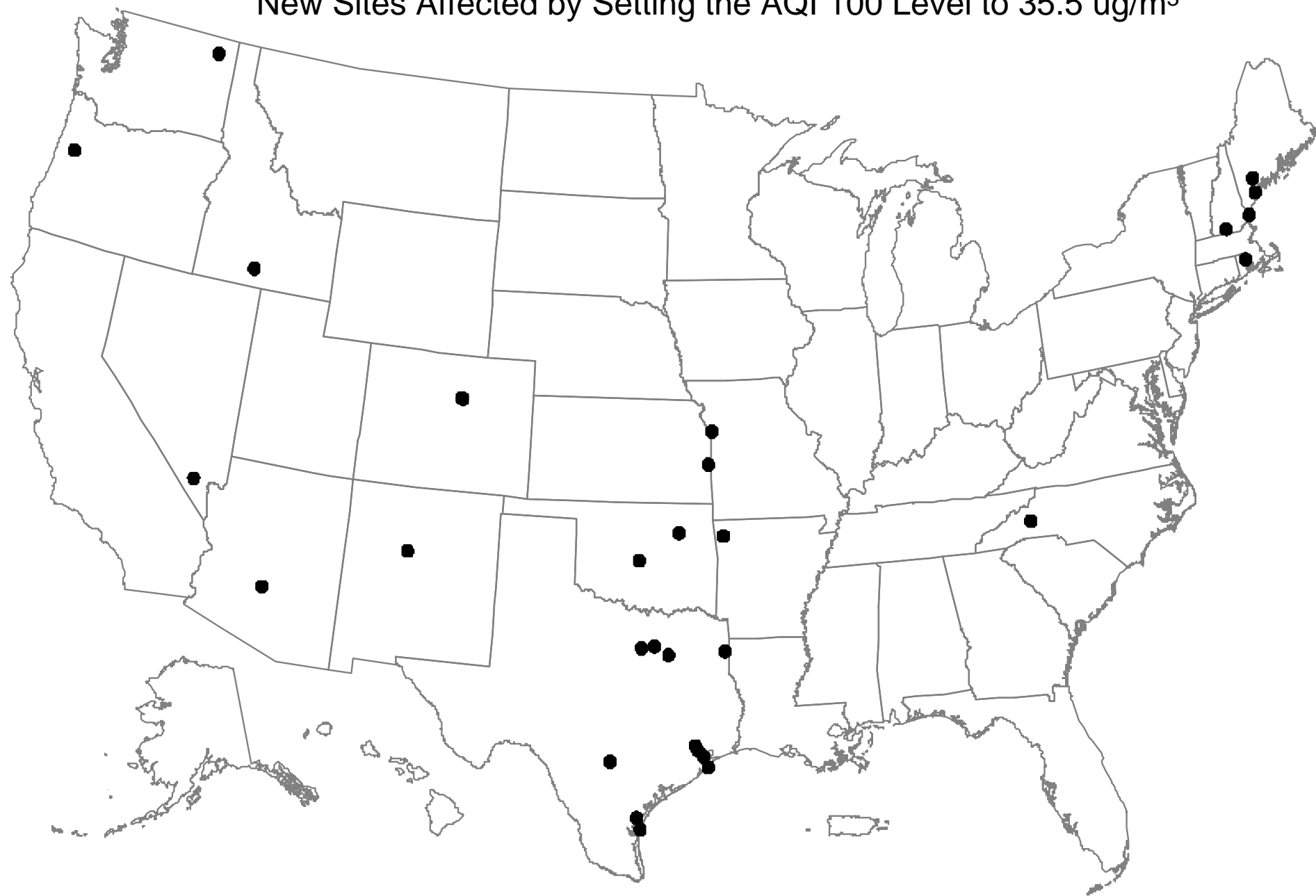
October 2003 – October 2006



Sites shown have at least 845 observations over three years

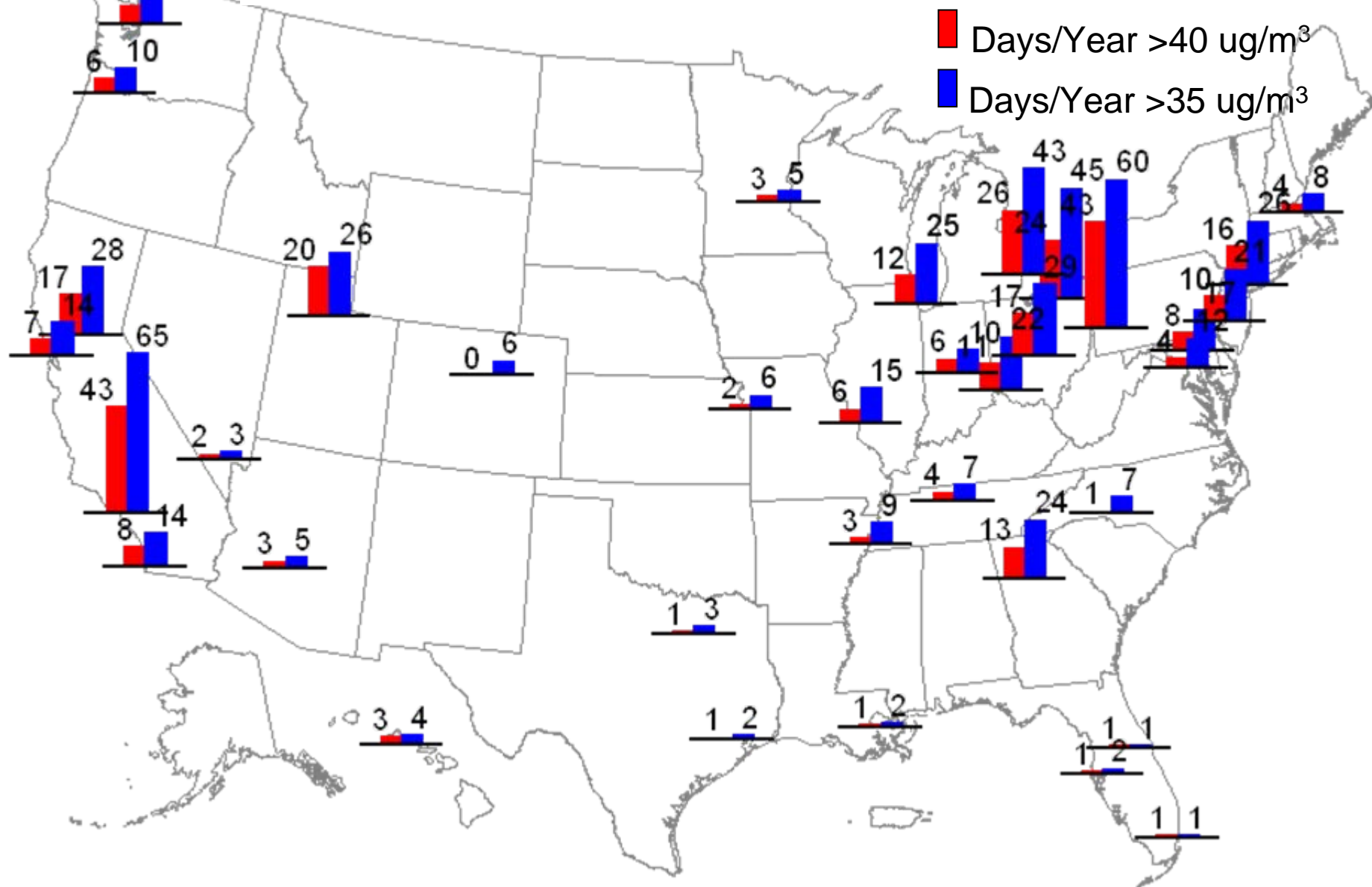


# New Sites Affected by Setting the AQI 100 Level to $35.5 \text{ ug/m}^3$



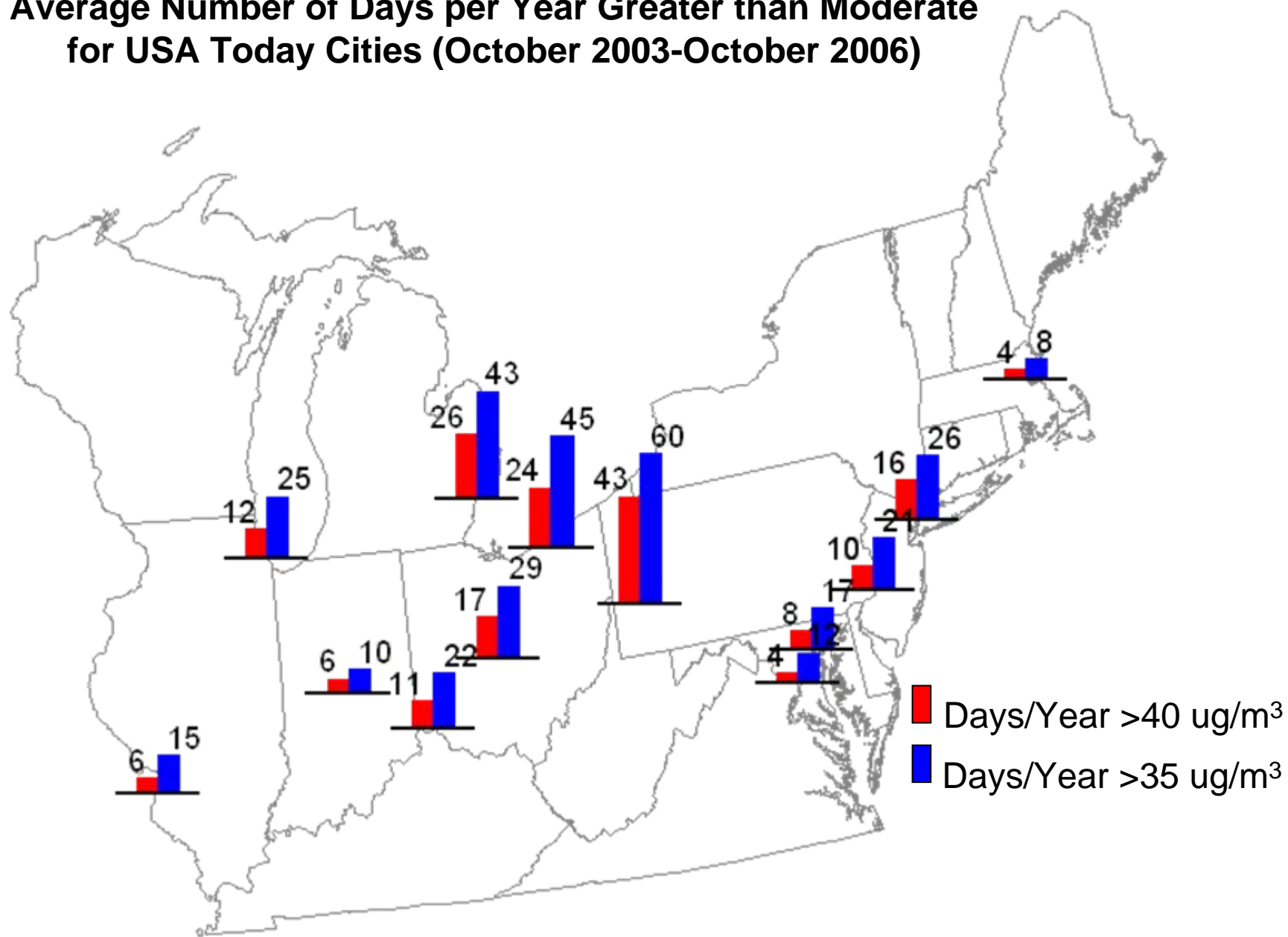
Sites shown have at least 845 observations over three years (October 2003-October 2006)





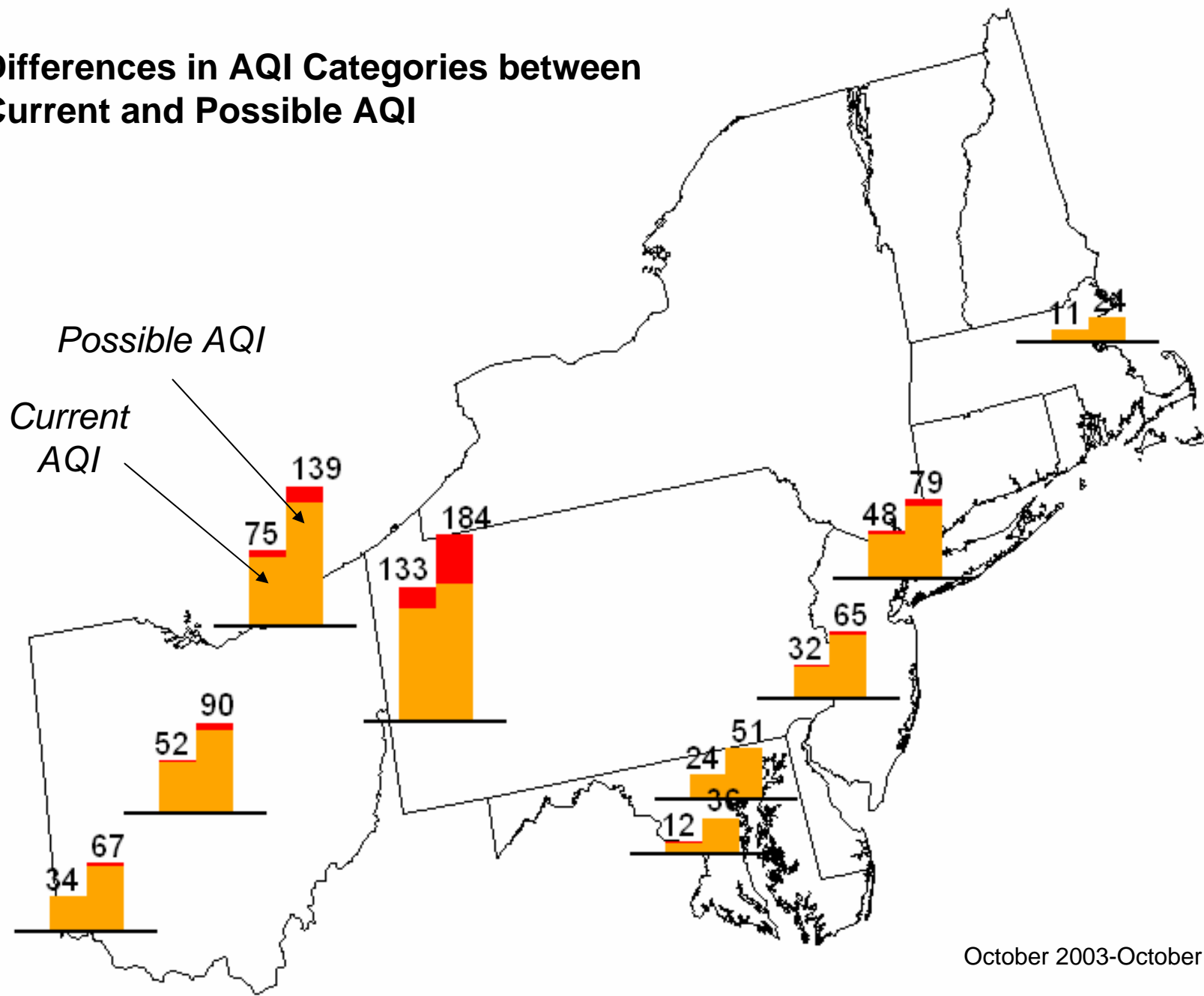


## Average Number of Days per Year Greater than Moderate for USA Today Cities (October 2003-October 2006)





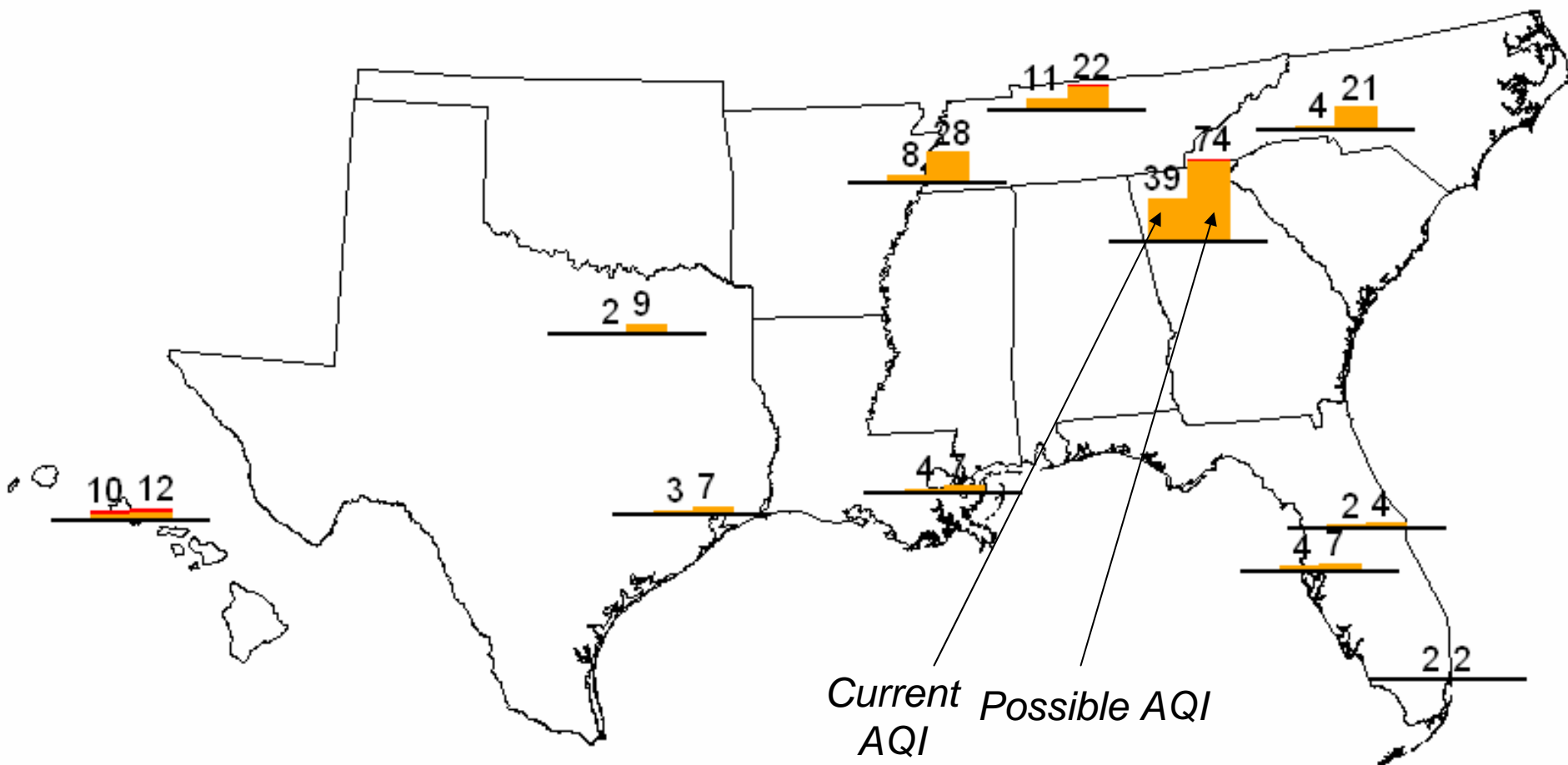
## Differences in AQI Categories between Current and Possible AQI



October 2003-October 2006

Values reflect total number of days over three year period

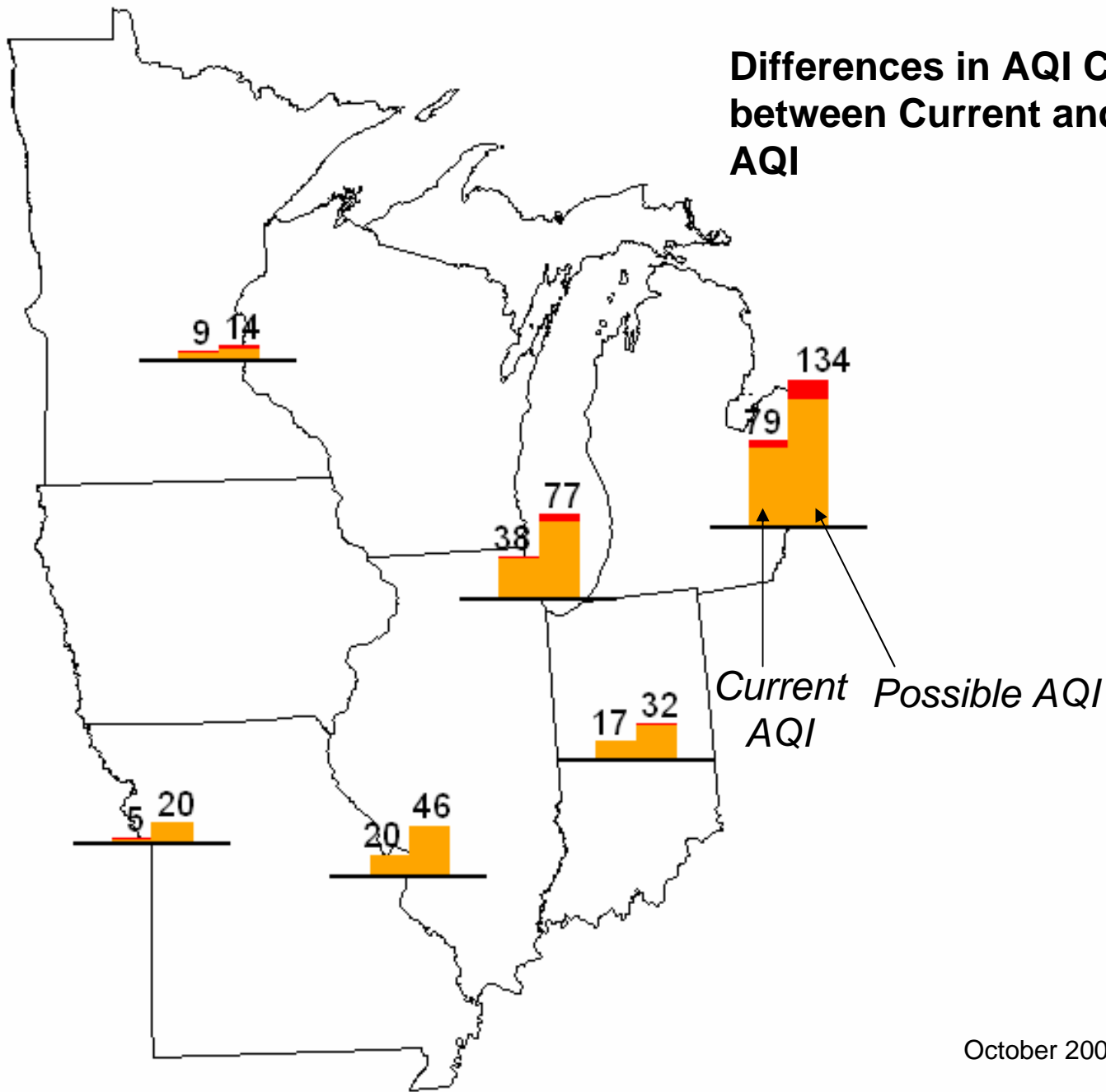
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October 2003-October 2006

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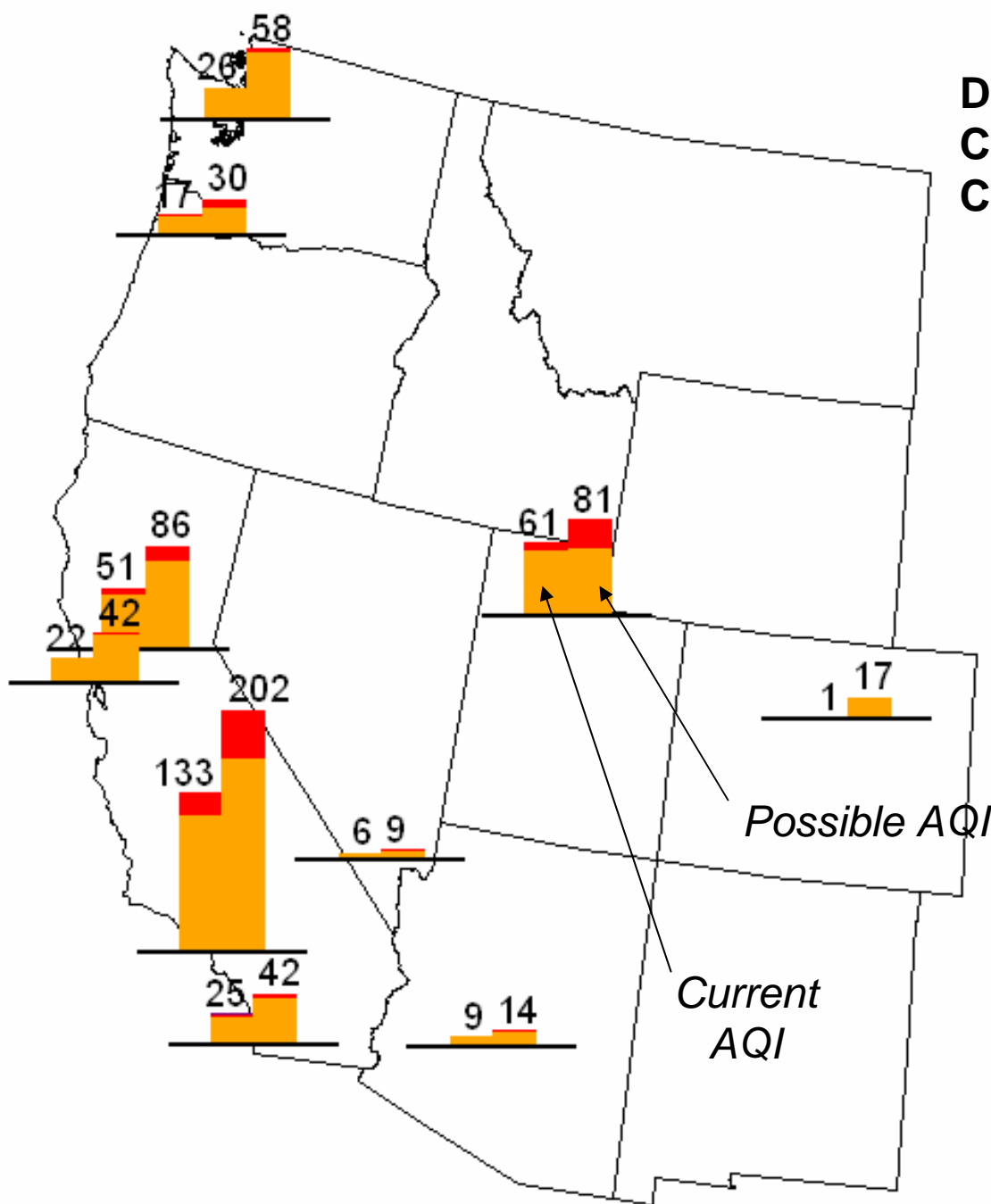
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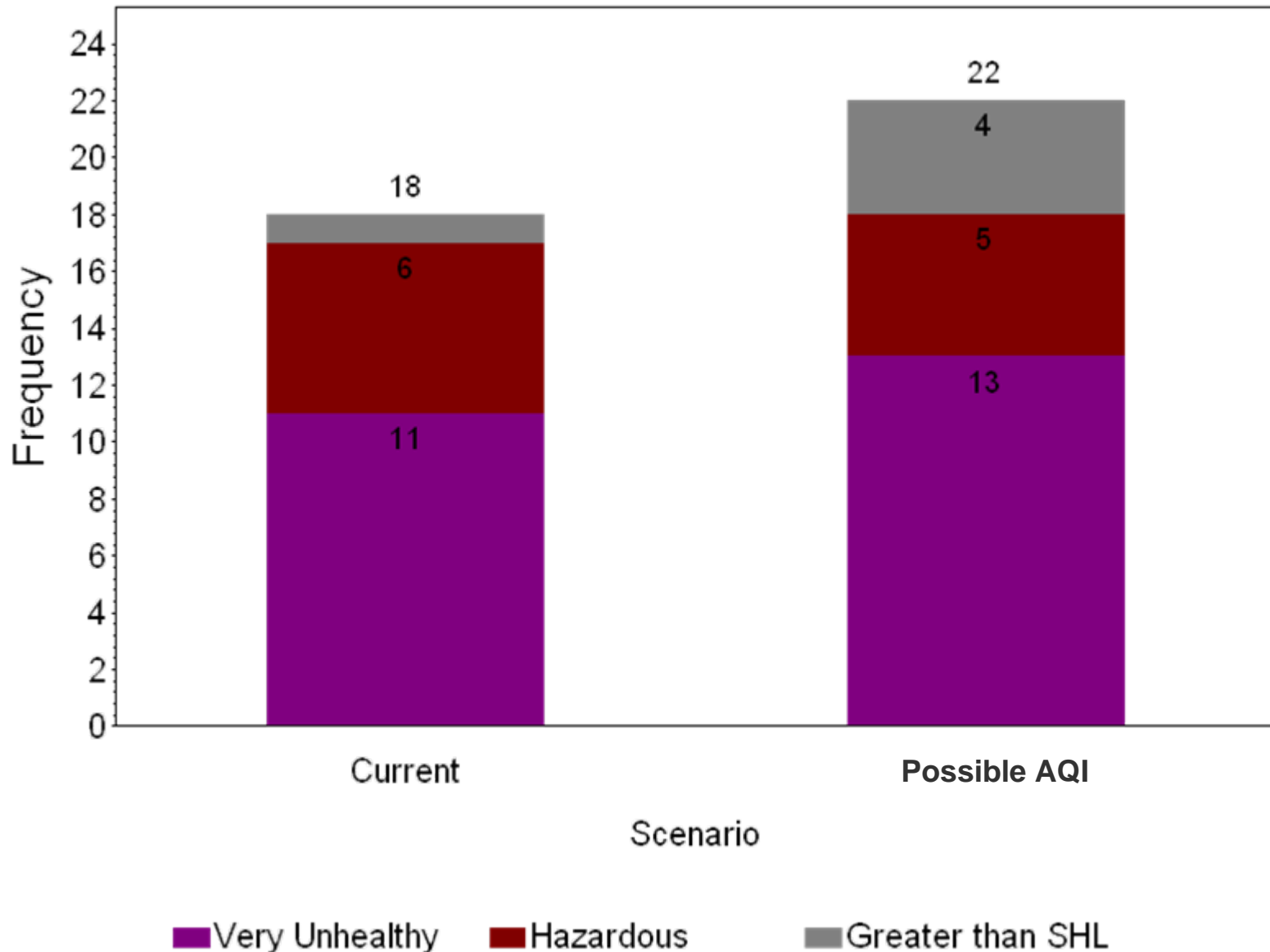


October 2003-October 2006

Values reflect total number of days over three year period

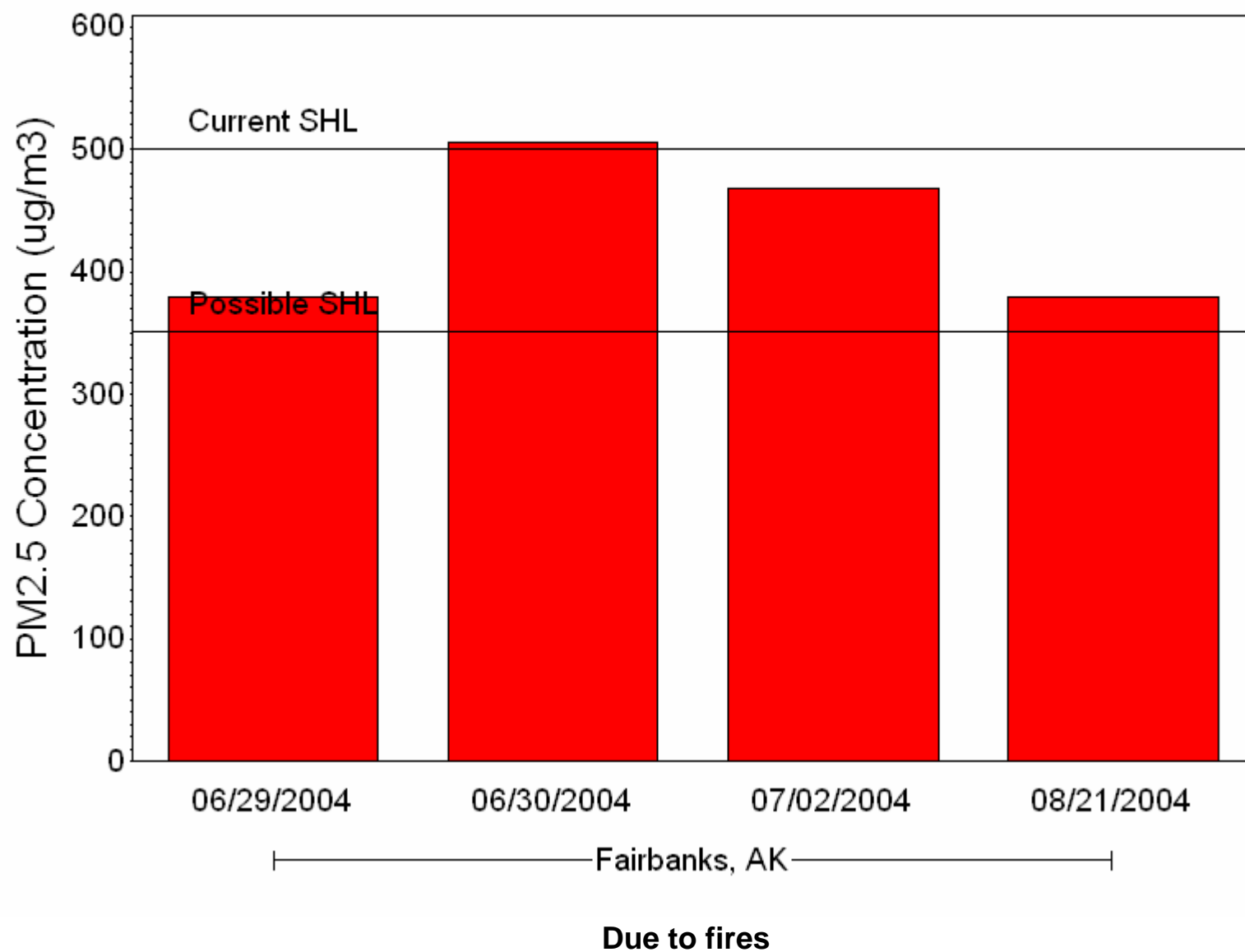


## Number of Site-Days greater than an AQI value of 200 (October 2003-October 2006)





## PM2.5 Observations Greater than the Significant Harm Level





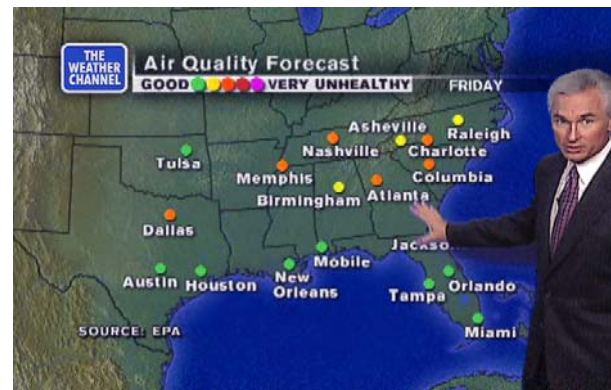


# The Message

- The greatest increase in days when comparing the current AQI to the new approach occurs in the “Unhealthy for Sensitive Groups” category followed by the “Unhealthy” category
- There is little or no increase in the number of days for AQI categories above “Unhealthy” for most urban areas

# Some Key Questions

- Will lowering the  $PM_{2.5}$  sub-index breakpoints present unusual forecasting or communication problems?
  - Will more cities consider implementing a forecasting program?
  - For existing programs will forecasts need to be extended into additional seasons?
  - How to communicate the additional Code Orange or Red days?
- How do agencies deal with very short-term (1-hr) high peaks of  $PM_{2.5}$  now?
- Is more recent information available about public health impacts associated with high  $PM_{2.5}$  episodes?
- Any others?



# Next Steps for AQI and SHL Rulemaking

- Seek stakeholder feedback
- Publish proposed rule – late summer/fall 2007
- Publish final rule – winter 2008
- Issue guidance on 1-hr advisories that can be used in high PM<sub>2.5</sub> episodes
- Develop related outreach and educational materials to help communicate to the public that air quality is getting better, not worse



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questions:

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